



## Subject card

Subject name and code	Operational safety of electrical devices, PG_00057337						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish -		
Semester of study	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Stanisław Czapp				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	45		7.0		48.0	100
Subject objectives	To achieve ability of designing and maintenance of electrical devices.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_K04] is able to react in emergency situations, health and life threatening when using power equipment	Student knows the principles of applying the protection devices and rescue of people.			[SK5] Assessment of ability to solve problems that arise in practice		
	[K7_U02] is able to use known mathematical and numerical methods to analyze and design elements, systems and power transmission networks and internal installations	By calculation and measurement estimates effectiveness of protection against electric shock in electrical installations.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		
	[K7_W04] has advanced, ordered and theoretically grounded knowledge in the field of operation and selection of electrical machines, power transmission systems and power electronic devices, classical and forward-looking power technologies and their receivers, knows the principles of selection of power equipment and installations and their receivers and their operation	Student interprets effects of current on human beings. Specifies and explains the means of protection against electric shock in LV systems and HV systems.			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_W06] knows the extended issues of reliability of power equipment and diagnostics of defects in this equipment	Student knows and apply the principles of ergonomics, safety and hygiene at work.			[SW1] Assessment of factual knowledge		
[K7_U06] is able to apply basic and advanced knowledge of power equipment and transmission network and internal installations to the preliminary design of a modern power plant or part thereof	The student performs design calculations.			[SU4] Assessment of ability to use methods and tools			

Subject contents	Electrical safety. Health and safety management systems. Occupational risk assessment. Electric shocks. Effects of current on human beings and livestock, threshold of perception, of let-go, of ventricular fibrillation. Electrical impedance of the human body. Touch voltage and body current. Earthing. Earth electrodes, soil resistivity, earthing resistance and their measurement. Earthing resistance calculation. Protection in low voltage installations. Basic protection. Insulation resistance, leakage currents. Protection in case of fault, additional protection. Calculation and testing. Protection in high voltage installations. Earth fault current calculation. Reduction factors related to earth wires and metal sheaths. Earthing system for HV installations. Measuring touch voltages. Other hazards. Sources of hazards and protection. Work ergonomics and hygiene. LABORATORY Laboratory model for demonstration of means of protection against electric shock. Earthing in LV systems. Conductivity of floor and wall testing. Effectiveness of protection against electric shock testing in installations with RCDs. Earth loop impedance measurement. Earthing electrode resistance measurement. Conductivity of soil measurement. Insulation resistance measurement.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test	50.0%	67.0%
	Lab	100.0%	33.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Czapp S.: Ochrona przeciwporażeniowa w sieciach i instalacjach niskiego napięcia. PWN, Warszawa 2023.</li> <li>2. Markiewicz H.: Bezpieczeństwo w elektroenergetyce. WNT, Warszawa 2017.</li> </ol>	
	Supplementary literature	Musiał E.: Instalacje i urządzenia elektroenergetyczne, WSP, Warszawa, 2008.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>1. Threshold of let-go for 50 Hz sinusoidal current is:</p> <p>a) 1 mA</p> <p>b) 10 mA</p> <p>c) 30 mA</p> <p>2. A-type residual current devices detect:</p> <p>a) alternating earth fault current and pulsating direct earth fault current</p> <p>b) only alternating earth fault current</p> <p>c) only pulsating direct earth fault current</p> <p>3. Permissible earth potential rise for long duration of current flow in 110/15 kV substation is:</p> <p>a) 80 V</p> <p>b) 160 V</p> <p>c) 50 V</p>		
Work placement	Not applicable		